A non-isostatic global sea level response to barometric pressure near

5 days

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Abstract

Changes in surface atmospheric pressure usually induce an isostatic response in the ocean characterized by an adjustment in sea level at the rate of approximately -1 cm/hPa. Nonisostatic signals are, however, observed at many tropical tide gauges at periods near 5 days. Our analysis of TOPEX/POSEIDON altimeter data reveals the global nature of these signals, involving nonisostatic sea level fluctuations with nearly uniform phase within separate basins and an out-of-phase oscillation between the Atlantic and Pacific Oceans. Comparisons with a barotropic model link the observed response to a 5-day Rossby-Haurwitz wave in the atmosphere and show that constrictions between basins prevent an isostatic response from being established. The apparent importance of forced, nonresonant modes in the nonisostatic response contrasts with the predominantly resonant dynamics at higher frequencies and may be relevant to explain the behavior of the long period tides.